

**DRIVER LICENSING GUIDELINES
FOR
MEDICAL ADVISORY BOARDS**

Relating Functional Ability to Class of Vehicle

**U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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SECTION I

INTRODUCTION

Responsibility for licensing motor vehicle operators rests with state motor vehicle departments. Licensing administrators rely heavily on recommendations from medical advisors in problem cases where questions arise as to whether physical or mental impairments of an individual would make him an unacceptable risk as a driver on public highways.

Medical advisory or review boards have been established in most of the states, but they lack uniformity in organization, policies, and procedural practices. Nevertheless, there is one common denominator - they operate in a medical interpretive advisory role. Their recommendations are based on a review of medical conditions which may constitute driver limitation and cause an individual driver to be a hazard on highways. Driver licensing administrators render decisions based on medical advice in combination with other facts pertinent to each case.

The Highway Safety program Standards of the National Highway Safety Bureau include a provision that in each state there be "a system providing for medical evaluation of persons whom a driver licensing agency has reason to believe may have mental or physical conditions which might impair their driving ability." The standards also specify "a medical advisory board or equivalent allied health professional unit composed of qualified personnel to advise the driver license agency on medical criteria and vision standards."

The criteria outlined in this guide have been developed along functional and symptomatic lines,

rather than along pathological and anatomic classifications. It is the functional and symptomatic limitations of illness that directly affect driving capability.

The functional criteria selected are common to several different disease entities or impairments. For the purpose of these guidelines, subdivisions of functional level have been grouped within the seven categorical headings of the text. From an evaluation of the relationship between the type of license and the functional ability required for the three classes of licenses, recommended license limitations are given, in tabular form where feasible. Only three basic classes* of driver licenses are included, since it would be impractical to discuss all the existing classifications**established by the States.

An advisory board may determine more specifically the category of license for which a driver is qualified under its own state licensing system. Drivers of vehicles transporting highly hazardous cargoes may be required to meet higher functional criteria than those driving vehicles carrying conventional loads. Certain groups of drivers should be reevaluated periodically so that recommendations made in the past may be revised if the degree of impairment changes. In certain circumstances a license may be issued describing the limitations under which a driver may operate a motor vehicle.

The guidelines have been developed as a constructive approach toward uniformity in evaluation of acceptable functional levels for granting driving licenses. Although they are based on the best evidence and advice

*I - Passenger Transport - for drivers operating vehicles such as buses, limousines for hire, including airport limousines, ambulances, taxicabs, or other vehicles carrying passengers on a commercial basis.

II - Cargo Transport - for drivers operating nonpassenger carrying vehicles on chassis larger than those of standard passenger cars, such as cargo trucks, moving vans, tank trucks, tractor-trailers, and similar equipment.

III - Private Auto - for drivers of personal and private passenger vehicles not for hire.

**A classified license system is a method of issuing licenses identifying the types or classes of vehicles an individual is qualified to operate.

now available, further research and epidemiologic studies will show the need for revision and updating.

Objectives of this guide differ from those of the guide for physicians prepared by the Committee on Medical Aspects of Automotive Safety of the American Medical Association. The latter is designed to assist the physician in advising his patients on a confidential basis. These criteria are suggestions for evaluation of driving capability after this capability has become a matter of concern to the driver licensing agency.

In summary, these guidelines are presented as an aid to advisory or review boards. It is not the intent to suggest strict adherence to criteria under all circumstances. Judgment of each state advisory board must take into consideration individual, local, and regional factors. The total functional capacity of the individual, including evidence of compensation for impairment, must be evaluated.

SECTION II

ALTERATIONS OF CONSCIOUSNESS

(Table 1)

Alertness while driving is essential for the safe operation of a motor vehicle. Total loss of consciousness or alteration of perception short of loss of consciousness, may be due to primary central nervous system disease such as a seizure disorder. Diabetic hypoglycemia, renal hypertension, and thyroid disease are examples of clinical entities which are not primary to the central nervous system but can lead to alterations in consciousness. These and other diseases have as their common effect on safe driving episodic alterations of consciousness. It therefore seems practical to address our attention to this symptom.

Table 1. ALTERATIONS OF CONSCIOUSNESS AND ACCEPTABLE LEVELS OF FUNCTION FOR DRIVER LICENSURE

Group	I Passenger transport	II Cargo transport	III Private auto	IV Periodic reevaluation	V Limited license
A	yes	yes	yes	yes	no
B	no	no	yes	yes	no
C	no	no	no	yes	yes ^a

^ai.e. Nocturnal epilepsy and stress hypoglycemia.

A lapse or alteration of consciousness severe enough to cause the person to lose his postural attitude or to be unable to continue whatever action he was in-

volved in would cause that individual to be reviewed under this section. Isolated incidents of lapses of consciousness without likelihood of recurrence need not be considered here (e.g. head trauma, fainting).

All individuals who have had one episode of altered consciousness should be grouped as follows:

Group A – Individuals who have not had an episode of altered consciousness for the preceding 3 years,

Group B – Individuals who have had an episode of altered consciousness in the preceding 3 years but not within the last year, and

Group C – Individuals who have had an episode of altered consciousness in the preceding year.

REFERENCES

ALTERATIONS OF CONSCIOUSNESS

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- 2 – Symposium – Medical Aspects of Motor Vehicle Accident Prevention – New York State Journal of Medicine 56:3863-3865, Dec. 15, 1956.
- 3 – The Legal Rights of Persons with Epilepsy. The Epilepsy Foundation, Washington, D.C., 1965.

SECTION III

CARDIOVASCULAR FUNCTION

This section deals with heart disease, hypertensive vascular disease, peripheral vascular disease, and aneurysms.

Heart Disease (Table 2)

Acute myocardial infarction is the most common medical cause of sudden death behind the wheel. Though it represents the severest kind of driving impairment, it accounts for only a small proportion of highway accidents. Lesser degrees of acute coronary insufficiency may cause transient alterations of consciousness and anginal pain that can be distressing enough to result in significant impairment of driving ability. The level of consciousness may be impaired by two separate and distinct mechanisms. The first of

Table 2. ORGANIC HEART DISEASE AND ACCEPTABLE LEVEL OF FUNCTION FOR DRIVER LICENSURE

Group	I Passenger transport	II Cargo transport	III Private auto	IV Periodic reevaluation	V Limited license
A	(Individual consideration) yes			yes	no
B	no	no	yes	yes	yes
C	no	no	(unsafe-no)	no	no
D	(Individual consideration, based on risk)				

^a Time to be set by evaluation of advisory board.

these is inadequate perfusion of the brain secondary to a mechanically impaired heart. The second is impaired ventilatory capacity of the lungs secondary to heart disease. This latter category, often called dyspnea, may be caused by primary lung disease, but this will be considered separately.

Organic heart disease is divided into three groups. A fourth group deals with certain arrhythmias.

Group A – A driver is in Group A when:

- (1) he has asymptomatic heart disease, and
- (2) the single or double Master's Two Step Test does not produce symptoms, or alterations of the ECG., and
- (3) prolonged exertion, emotional stress, hurrying, hill climbing, recreation, or daily activities do not produce pathological symptoms, and
- (4) signs of congestive heart failure are not present.

Group B – A driver is in Group B when he has organic heart disease and one or more of the following:

- (1) walking one to two level blocks, climbing one flight of stairs, or the performance of usual activities produces symptoms, or
- (2) Master's Two Step Test produces symptoms and ECG changes indicative of anoxia, or
- (3) emotional stress, hurrying, hill climbing, recreation, or similar activities produce pathologic symptoms, or
- (4) signs of congestive failure, if present, are relieved by therapy.

Group C – A driver is in Group C when he has organic heart disease with symptoms at rest, and one or both of the following:

- (1) The performance of any of the activities of daily living beyond the personal toilet or its equivalent produces increased discomfort, or
- (2) signs of congestive failure, if present, are resistant to therapy.

Group D – This group includes individuals with cardiac arrhythmias. While some of these ailments, such as

chronic asymptomatic atrial fibrillation, usually do not present notable impairments, others such as paroxysmal atrial flutter do present a high risk of catastrophe. Hence, consideration must be based on their risk factor, which can be arrived at only by evaluating each disease entity.

Cardiac Pacemakers

Individuals with implanted pacemakers to control heart rate should not drive cargo or passenger transport vehicles. They may reasonably be permitted to drive private automobiles, if given a medical review at 3-month intervals by a physician familiar with cardiac pacemakers.

Hypertensive Vascular Disease (Table 3)

Hypertension, because of its effects on the brain and other organs of the body, is of importance with respect to driving ability. A repeatedly elevated diastolic pressure over 90 mm Hg. in an untreated individual is, for purposes of these guidelines, assumed to be diagnosis of hypertension. Transient headaches from this disease must be judged on an individual basis to determine their severity, frequency, and subsequent interference with the individual's driving ability.

Table 3. HYPERTENSIVE VASCULAR DISEASE AND ACCEPTABLE LEVEL OF FUNCTION FOR DRIVER LICENSURE

Group	I Passenger transport	II Cargo transport	III Private auto	IV Periodic reevaluation	V Limited license
A	yes	yes	yes	yes	no
B	no	no	yes	yes	no
C	no	no	(individual consideration)	yes	(individual consideration) (usually unsafe)
D	no	no	(individual consideration)	no	no

Group A - Diastolic pressure repeatedly over 90 mm Hg. and none of the following:

- (1) abnormalities of urinalysis or urinary function tests;
- (2) history of hypertensive cerebrovascular damage;
- (3) evidence of left ventricular hypertrophy, or
- (4) hypertensive abnormalities of the optic fundus, except for minimal narrowing or sclerosis of arterioles. (Keith-Wagner Retinopathy, Stage I).

Group B - A repeatedly elevated diastolic pressure over 90 mm Hg. and any one of the following:

- (1) proteinuria and abnormalities in the urinary sediment but no impairment of renal function;
- (2) history of hypertensive cerebrovascular damage without residuals;
- (3) evidence of left ventricular hypertrophy, or
- (4) definite hypertensive changes in the retinal arterioles without hemorrhages. (Keith-Wagner Retinopathy, Stage II).

Group C - A repeatedly elevated diastolic pressure over 90 mm Hg. and any two of the following:

- (1) diastolic pressure usually in excess of 120 mm Hg.;
- (2) proteinuria and abnormalities in the urinary sediment, with evidence of impaired renal function;
- (3) hypertensive cerebrovascular damage with permanent neurological residuals;
- (4) left ventricular hypertrophy;
- (5) retinopathy of arterioles, with hemorrhages and exudates. (Keith-Wagner Retinopathy, Stage III).

Group D - Repeatedly elevated diastolic pressure over 120 mm Hg. and any two of the following:

- (1) diastolic pressure usually in the range of 140 mm Hg. or more;
- (2) proteinuria and abnormalities of the urinary sediment with evidence of nitrogen retention;
- (3) hypertensive cerebrovascular damage with permanent neurological impairment;
- (4) left ventricular hypertrophy;

- (5) retinopathy of arterioles with papilledema.
(Keith-Wagner Retinopathy, Stage IV).

Vascular Disease Affecting the Extremities (Table 4)

The importance of this category to the ability to drive safely depends on the impairment of the functional use of the affected extremity or extremities. This category is divided into three groups. Presence of vascular disease is presumed to have been diagnosed by existing conventional methods. Loss of pulses or arterial calcification is not considered an impairment to driving.

Table 4. VASCULAR DISEASES AND ACCEPTABLE LEVEL OF FUNCTION FOR DRIVER LICENSURE

Group	I Passenger transport	II Cargo transport	III Private auto	IV Periodic reevaluation	V Limited license
A	yes	yes	yes	yes	no
B	no	no	yes	yes	no
C	no	no	(individual consideration)	no	no

Group A — A driver is in Group A when he has vascular disease and;

- (1) experiences neither intermittent claudication nor pain at rest, or
- (2) experiences only transient edema.

Group B — A driver is in Group B when he has vascular disease with *any one* of the following:

- (1) intermittent claudication occurring on walking more than 25 yards;
- (2) vascular damage evidenced by healed amputation of any number of digits of one extremity or amputations at or above the wrist or ankle of one extremity with evidence of persistent vascular disease;
- (3) healed or persistent superficial ulceration, and
- (4) moderate to marked edema which is only partially controlled by elastic supports.

Group C – A driver is in Group C when he has vascular disease with one of the following:

- (1) intermittent claudication on walking less than 25 yards, or severe and constant pain at rest;
- (2) vascular damage evidenced by amputations of 3 or more digits of each of two extremities, with persistent vascular disease;
- (3) persistent, widespread, or deep ulceration involving any number of extremities.

Vascular Aneurysms

Arterial and arterio-venous aneurysms must be considered separately since they may not produce symptoms that interfere with driving. Some of these aneurysms, however, do have a high risk of rupturing. Therefore, they represent a serious danger, as they may cause a catastrophe. Each case should be given individual consideration. The following recommendations are intended to be very general:

(1) Femoral and Popliteal Aneurysms

These disorders usually are associated with prodromal symptoms that warn the driver of impending difficulty. Hence, drivers are usually able to avoid dangerous situations if complications develop. Persons with such conditions should be advised that long periods of sitting are dangerous to the aneurysm. After such advice, however, they should be able to drive private automobiles safely. They should not be recommended for licenses to drive cargo or passenger transport vehicles.

(2) Aortic and Central Nervous System Aneurysms

These vascular disorders present a very high risk and drivers of all types of vehicles should be given a careful individual evaluation of past history. In general, such individuals usually should not be recommended for a private vehicle license. None should be recommended for cargo and transport licenses.

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CARDIOVASCULAR FUNCTION

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- 4 - Natural Death at the Wheel, West et al. J.A.M.A. 205:266-277, July 29, 1968.

SECTION IV

HEARING

Deafness

The relationship between hearing deficiencies and ability to drive safely is ill-defined. Loss of hearing is not a serious defect in many situations because the average person adjusts to his loss and compensates for it. Many variables are involved in evaluating the driving capability of the hard of hearing. Deafness is not an "all or none" phenomenon. There are degrees of hearing impairment. The sound level of the driving environment also is variable, both inside and outside of the vehicle. It has been suggested that a totally deaf person, aware of his handicap and trained to cope with it, is probably a safer person than one with little or no impairment who drives with windows closed, air conditioner operating, radio playing at high volume, and is unaware that he is, for practical purposes, totally deaf to outside sounds.

Some state jurisdictions and the Interstate Commerce Commission have specific regulations which disqualify the totally deaf from holding licenses to operate passenger transport and certain types of commercial vehicles. Results of studies on the deaf driver are not in agreement.⁽¹⁾⁽²⁾⁽⁴⁾ In general, however, the deaf driver accident rate is approximately the same as as that of the nondeaf driver.

For the purpose of this section, "hard of hearing" is defined as inability of a subject to pass a voice

recognition test,* or any equivalent test selected as appropriate by the medical advisory board. An individual who habitually uses a hearing aid may wear it during the test. It is suggested that such individuals whose cases have been referred to the advisory board be grouped as follows:

- A. Hard of hearing from before the age of 15 years;
- B. Became hard of hearing after 15 years of age and has been aware of deficiency for more than 4 years;
- C. Became hard of hearing after 15 years of age and has been aware of deficiency for less than 4 years.

In the absence of other adverse factors, individuals in all the above categories may be recommended for a private passenger vehicle license, with these restrictions:

- Those in groups A, B and C should drive only in vehicles equipped with two side mirrors in addition to the inside rear view mirror.
- Those in group C, in addition to the above requirement, should have completed satisfactorily a course especially designed for the deaf driver.

There are relatively few deaf people employed as drivers of cargo transport or passenger transport vehicles. Hence there is a scarcity of data which would either support or refute the capability of the deaf individual to drive such vehicles safely. From the medical standpoint, it would seem logical to recommend licensing under the same restrictions suggested for group C for drivers of private passenger vehicles. The advisory board would need to consider existing state laws and regulations on this matter and might well consider the possibility of license limitations in connection with either cargo or passenger transport involving special hazards.

*Ability to correctly identify four out of five numerals spoken in each ear with the examiner standing 2 feet behind the patient.

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- 2 - The Deaf Community: Studies in Social-Psychology of Deafness, Washington Study, Scheine, J., Ph.D., Washington, D.C., Golliduct College Press, 1968 (in Press).
- 3 - Guide for Aviation Medical Examiners, Department of Transportation, January 1968.
- 4 - Deafness and Driving, N. Roydhouse, New Zealand Medical Journal 1967 v66 p878-881.

SECTION V

MENTAL CONDITION

Emotional disturbance on the part of a motor vehicle operator may present medical advisory boards with their most difficult challenge. Existence of a wide variety of psychological impairments, forms of treatment, and degrees of individual variation make it difficult to define and especially to accurately assess the levels of emotional impairments.

It is apparent that most serious cases of impairment will be hospitalized and in most states this causes a temporary suspension of the driving privilege. In some of these states, the suspension is automatic, without regard to whether the confinement was voluntary or involuntary. A patient having enough judgment to seek medical help on his own volition may be as safe a driver as his non-hospitalized peer, regardless of the diagnosis. These cases should be individually considered.

After hospitalization, the physician should evaluate the ability of the individual to drive. Concern for the welfare of the patient and consideration of the therapeutic benefits of driving will play a part in his decision. On the other hand, it is the responsibility of each state's medical advisory board to protect the whole public. To this end, the board must be most concerned with the individual's fitness to drive.

In cases of discharged inpatients, there may be some question as to their future emotional behavior which could affect safe driving. In such cases there should be an observation period of up to one year pending

restoration of license. After this period, their personal adjustment will be evaluated and subsequent recommendations of the board can be based on current function.

The more numerous and perhaps more difficult cases are those illnesses that do not require hospitalization. These cases encompass some of the schizophrenias, character disorders, and the affective reactions, as well as most of the psychoneuroses. Many of these cases can be treated satisfactorily as outpatients, combining supportive, analytical, and pharmacological regimens. The National Community Mental Health Program is providing many more community-based outpatient facilities. An individual usually does not fit neatly into one diagnostic category. It is valid here to evaluate the driver's license application on the basis of functional ability. The ability to maintain a reasonably stable, realistic, and socially acceptable personality is an important function for safe driving. Individuals with an emotionally erratic pattern, showing periods of irresponsibility, outward or inward aggressiveness, or distorted perceptual thoughts have been identified by accident investigators as potentially high risk groups in motor vehicle accidents.

A person with two or more convictions for crimes of violence against others may have severe emotional disturbances and should have careful evaluation of his mental function before being recommended for any class of license.

In evaluation of the applicant with a history of mental illness, therefore, particular attention should be given to impulsiveness, aggressive actions toward others, suicidal tendencies, and paranoid thoughts. These personality characteristics often become apparent in police records, work records, job disability records, and in the histories of marital difficulty. These records are therefore a fruitful area for evaluation.

REFERENCES

- 1 - Guide for the Identification, Evaluation and Regulation of Persons with Medical Handicaps to Driving. Julian A. Waller, A.A.M.V.A., 1967, pg. 25-28.
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- 3 - Medical Guide for Physicians in Determining Fitness to Drive a Motor Vehicle. Neurological, Emotional and Psychiatric Disorders Section. To be published by the A.M.A.
- 4 - A Review of 355 Driver License Applicants Who Had Worse Driving Records Following Medical Evaluation Than Before, by the North Carolina State Medical Society Advisory Committee to the Department of Motor Vehicles, July 1967.

SECTION VI

MUSCULOSKELETAL PERFORMANCE

The driver of an automobile today should be able to perform certain tasks that are necessary for proper control of a motor vehicle. These manual tasks should be executed in an efficient and effective manner. They include steering, braking, accelerating, and maneuvering the vehicle. Because certain joints and limbs are repeatedly required to perform these tasks, their ability to do so should be evaluated by competent medical personnel. Since there is no one standard of motor vehicle design, the following suggested guidelines should be used as a flexible basis for licensing recommendations.

Motor vehicle equipment is variable, from power brakes to sophisticated hand and foot controls, so in many cases the best evaluation of driving performance still remains the practical road test. Despite the limitations, however, the guidelines do offer a standard of performance that would be needed to safely control a motor vehicle conventionally equipped with power steering, power brakes, and automatic transmission. In cases of standard transmission, the added tasks should be taken into account.

1. Motor Power Requirements (Table 5)

The muscles of the right lower extremity and both upper extremities are the ones most commonly called on to perform the tasks of driving. The testing of these muscles is based on two factors: the force of gravity and the resistance applied by the examining physician to the muscle group being tested. The determination

Table 5. MOTOR POWER AND ACCEPTABLE LEVEL
OF FUNCTION FOR DRIVER LICENSURE

Group	I Passenger transport	II Cargo transport	III Private auto	IV Periodic reevaluation	V Limited license
A	yes	yes	yes	no	no
B	no	no	yes	yes	no
C	no	no	(individual consideration)	yes	yes

of muscle strength should be based on the physician's interpretation as to whether the strength is:

- a. *Normal* - complete range of motion against gravity with full resistance.
- b. *Good* - complete range of motion against gravity with some resistance.
- c. *Fair* - complete range of motion against gravity without resistance.
- d. *Poor* - complete range of motion with gravity eliminated.
- e. *Trace* - evidence of slight contractility, no joint motion.
- f. *Zero* - no evidence of contractility.

Group A

- a. Normal muscle power as tested at all of the following joints:
 - (1) Right ankle dorsi and plantor flexion.
 - (2) Right knee extension.
 - (3) Hip flexion and extension.
 - (4) Grip - both hands.
 - (5) Both wrists - extension and flexion.
 - (6) Both elbows - extension and flexion.
- b. And at least good muscle power in flexion of the right knee.

Group B

- a. Muscle power classified as good or better at any one or more of the following joints:
 - (1) Right ankle dorsi and plantar flexion.
 - (2) Right knee extension.
 - (3) Hip flexion and extension.
 - (4) Grip - both hands.
 - (5) Both wrists - extension and flexion.
 - (6) Both elbows - extension and flexion.
- b. And at least fair muscle power in flexion of the right knee.

Group C

- a. Fair muscle power at any one or more of the following joints as listed in Group A.a. and B.a.
- b. And poor or worse muscle power in flexion of the right knee.

2. Active Range of Motion of Joints

Along with sufficient motor power, a driver must have adequate mobility of the joints that are important to the safe operation of a motor vehicle. Although one could define the necessary degree of joint motion for a single motor vehicle, the wide variety of models, makes, and years of design make it impossible to generalize. The range of motion necessary to lift the foot off the accelerator and onto the brake, or the range needed to turn the steering wheel will vary as to the specific vehicle and to the size of the individual. In some cases, a driver license applicant with a critical joint immobilized or ankylosed in a distorted manner may compensate very well and be able to operate a motor vehicle safely. Evaluation of this category of driver impairment must be based on individual consideration by the examining physician and on the performance of the road test.

3. Amputations

Loss of a part or the whole of a critical limb may not impair driving skills. Amputation of the fourth or fifth fingers of the hand would not severely

diminish the ability to grip a steering wheel. Absence of the right foot or one hand would have presented a serious handicap years ago, but with today's prosthetic devices the driver can be capable of operating a private automobile but probably not a commercial vehicle. In addition, there is the technical ability today to instrument cars so that the amputee may drive safely in most traffic situations. For these cases that are brought to the medical advisory boards for review, individual consideration would seem to be the best method of evaluation.

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SECTION VII

RESPIRATORY FUNCTION

Impairment of respiration can be a handicap to the safe operation of a motor vehicle. The decreased ability to adequately provide sufficient oxygenation of the blood to meet the demands of various activities required of the driver causes reduced concentration and deficiencies in his judgment. Dyspnea, or shortness of breath, is the most common subjective symptom of respiratory impairment. Although this symptom has diagnostic value, its severity is difficult to quantify. A wide variety of respiratory function tests can be quantitated and accurately correlated with the extent of pathological impairment. Respiratory diseases which are primarily diffusion defects at the alveolar membrane level of intrapulmonary vascular shunts may show normal mechanical pulmonary function tests but still be associated with poor oxygenation of the blood.

Table 6. ACCEPTABLE LEVELS OF RESPIRATORY FUNCTION
FOR DRIVER LICENSURE

Group	I Passenger transport	II Cargo transport	III Private auto	IV Periodic reevaluation	V Limited license
A	yes	yes	yes	no	no
B	(individual consideration)		yes	yes	yes
C	no	no	yes	yes	yes
D	no	no	no	yes	no

A severely diminished mechanical ability of the respiratory system is often associated with abnormal blood gas composition. It is not practical or necessary, however, to obtain blood gases on all cases of respiratory disease referred to the board. It is a recommended procedure for those cases which seem to have more functional impairment than can be ascribed on a mechanical basis. By assessing both the subjective effects of respiratory disease with effects that we can measure precisely, the degree of impairment can be separated into classes of impairment to driving.

Although the advisory board will not be directly involved in tests of respiratory function, certain background comments may be useful in interpretation of their results.

Tests of ventilatory function are not infallible, as there are areas of human performance that can affect the results. The tests require maximal voluntary effort on the part of the patient, who may be unable to or reluctant to perform the tests as well as his true respiratory capacity would allow. For this reason, the tests should be repeated if a significant impairment is noted. A bronchodilator should be administered if the cause of the respiratory deficiency is suspected to be bronchial obstruction. If there is a 15 percent improvement in subsequent tests after this treatment, these values must be considered to be the true state of the individual's respiratory capacity.

The tests most likely to give a survey of the driver's ventilatory capacity are the 1-second, forced expiratory volume ($FEV_{1.0}$), the forced vital capacity (FVC), and the determination of the maximal voluntary ventilation (MVV). Most test subjects can easily understand the performance of these tests after a short explanation and encouragement to participate actively. Results of these tests should be expressed in terms of liters or liters per minute and also as a percentage of the predicted normal. The $FEV_{1.0}$ and FVC should each be administered three times, with the best test result determined as most

representative of the patient's capacity. The MVV is a fatiguing test, requiring considerable muscular effort and for this reason the better of two attempts should be accepted.

Impairment to driving caused by ventilatory deficiency may be grouped as follows:

Group A — Chest X-rays are usually normal but may show healed or inactive disease of the chest. Dyspnea, if it occurs, is consistent with the type and degree of physical exertion. Values obtained from at least two of the ventilatory function tests are no less than 85 percent of predicted normal values for patient's age, sex, and height. Blood gases are usually within the normal range.

Group B — Chest X-rays are normal or abnormal. Dyspnea does not occur at rest and usually does not occur during the performance of usual daily activities. The subject can keep a normal pace with persons of his same age and body build on level ground without breathlessness, but not on hills or stairs. Values obtained from at least two of ventilatory function tests are in the range of 70 to 85 percent of the predicted normal values. Blood gases usually are normal but the oxygen partial pressure present on a random sample of arterial blood may be diminished to 75 mm. Hg.*

Group C — Chest X-rays may be normal but usually are not. Dyspnea does not occur at rest but is present during performance of usual daily activities. The individual can walk one mile at his own pace without dyspnea but is unable to keep up with his peers. Values of at least two ventilatory function tests are in the range of 55 to 70 percent of the predicted normal values. The blood gases are usually abnormal with the partial pressure of arterial oxygen no less than 70 mm. Hg.

*Numerical values may differ among laboratories and it should be noted that the following values are based on a lower limit of normal of 85 mm. Hg.

Group D - Chest X-rays are usually abnormal. Dyspnea occurs climbing one flight of stairs, walking 100 yards on the level, or even at rest. Values obtained from at least two ventilatory function tests are below 55 percent of the predicted normal value. The partial pressure of arterial oxygen is less than 65 mm. Hg.

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SECTION VIII

VISION

Good vision is essential for safe operation of a motor vehicle. It is important that all drivers have their eyes examined periodically, and it is particularly important for those drivers with potentially progressive visual disorders. Vision as related to driving should be evaluated in the functional areas of visual acuity, visual fields, ocular motility, dark adaptation, and color blindness. While depth perception and dynamic visual acuity may be important functional areas, current testing techniques do not have significant correlation with the visual requirements in driving. The road test, therefore, is still the best and most practical guide in these areas.

1. *Visual Acuity*

Prompt central visual acuity is required to interpret traffic signs and cues at usual speeds. Central visual acuity for distance should be recorded using the Snellen notation.

a. Binocular vision, Coordinated (Table 7)

Spectacle correction of 10 diopters or more precludes Group A and requires special evaluation for Group B.

Group A — Coordinate use of both eyes in binocular vision and the corrected visual acuity in both eyes at least 20/25.

Table 7. ACCEPTABLE LEVEL OF BINOCULAR VISUAL ACUITY
FOR DRIVER LICENSURE

Group	I Passenger transport	II Cargo transport	III Private vehicle	IV Periodic reevaluation	V Limited license
A	yes	yes	yes	yes	no
B	no	yes	yes	yes	no
C	no	no	yes	yes	no
D	no	no	no		

Group B - Coordinate use of both eyes in binocular vision and the corrected visual acuity of the better eye at least 20/40 and the poorer eye at least 20/60.

Group C - Corrected visual acuity of the better eye at least 20/40.

Group D - Corrected visual acuity of the better eye worse than 20/50.

b. Monocular Vision or Spectacle-Corrected Aphakic Driver (Table 8)

Table 8. ACCEPTABLE LEVELS OF MONOCULAR VISUAL ACUITY
FOR DRIVER LICENSURE

Group	I Passenger transport	II Cargo transport	III Private vehicle	IV Periodic reevaluation	V Limited license
A	no	no	yes	yes	no
B	no	no	no		

Group A - Corrected visual acuity of at least 20/50.

Group B - Corrected visual acuity worse than 20/50.

2. Visual Fields

Visual fields are obviously important for safe driving, since a driver must of necessity possess some

breadth of lateral awareness to pass approaching vehicles safely, as well as to be aware of vehicles or pedestrians approaching from the side.

a. Binocular Vision (Table 9)

Group A — Each eye tested separately must have a horizontal visual field of 140 degrees or more.

Table 9. ACCEPTABLE LEVELS OF BINOCULAR HORIZONTAL VISUAL FIELD FOR DRIVER LICENSURE

Group	I Passenger transport	II Cargo transport	III Private vehicle	IV Periodic reevaluation	V Limited license
A	yes	yes	yes	yes	no
B	no	no	yes	yes	no
C	no	no	no	no	no

Group B — The total horizontal visual field with both eyes open must be 140 degrees or more when one eye has a horizontal visual field of less than 140 degrees.

Group C — The total horizontal visual field is less than 140 degrees.

b. Monocular Vision (Table 10)

Table 10. ACCEPTABLE LEVELS OF MONOCULAR HORIZONTAL VISUAL FIELD FOR DRIVER LICENSURE

Group	I Passenger transport	II Cargo transport	III Private vehicle	IV Periodic reevaluation	V Limited license
A	no	no	yes	no	no
B	no	no	no	no	no

Group A — Eye has horizontal visual field of 140 degrees or more.

Group B – Eye has horizontal visual field of less than 140 degrees.

3. Ocular Motility

Drivers with a history on intermittent or uncontrolled diplopia should not be licensed for cargo or passenger transport vehicles and should receive careful consideration before obtaining a private vehicle license. Binocular muscle imbalance in the absence of diplopia or episodic monocular vision does not limit licensing for private, cargo transport, or passenger transport vehicles.

4. Color Blindness

Color blindness has been considered a potential cause of motor vehicle accidents. However, with the admixture of additional yellow to red signals, additional blue to green signals, and with the position of signals standardized, the problem of red-green confusion has been reduced. It is, therefore, doubtful if impaired or defective color vision is of statistical significance except in severe degrees of true achromatic vision.

Acceptable levels of color vision for driver licensure:

- a. Passenger Transport – No license with color blindness unless able to discriminate red, green, and yellow traffic signals.
- b. Cargo Transport – No license with color blindness unless able to discriminate red, green, and yellow traffic signals.
- c. Private Vehicle – Yes, unless associated defects such as reduced visual acuity or visual field, limits licensure.

5. Dark Adaptation

Dark adaptation and glare tolerance are important for safe twilight and night driving, but methods of measurement and standards are not well established. However, individuals with cataracts, retinal abnormalities, chronic pupillary constructions, or other known causes of glare intolerance or poor dark adaptation

should be carefully evaluated before being recommended for unrestricted licensure. Under certain conditions, licensure for daytime driving only may be recommended.

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